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PERT APPLICATIONS IN EDUCATIONAL PLANNING.

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THIS PAPER DISCUSSES THE CONCEPTS OF EDUCATIONAL PLANNING, THE PROGRAM EVALUATION AND REVIEW TECHNIQUE (PERT), AND THE POTENTIAL VALUE THAT PERT HAS FOR EDUCATIONAL PLANNING. THE DISCUSSION OF PLANNING IS LIMITED TO SHORT-RUN EDUCATIONAL PROJECTS. THE NATURE OF PERT IS DISCUSSED AND ITS APPLICABILITY TO PLANNING IS ESTABLISHED. SEVERAL BENEFITS WHICH RESULT WHEN PERT PRINCIPLES ARE APPLIED TO THE PLANNING FUNCTION ASSOCIATED WITH EDUCATIONAL RESEARCH ARE NOTED--(1) PERT OFTEN RESULTS IN CLEARER STATEMENT OF PROJECT OBJECTIVES AND GOALS, (2) PERT REQUIRES THAT THOSE INVOLVED IN THE PROJECT MAKE EXPLICIT THE MEANS BY WHICH THEY PLAN TO REACH THE OBJECTIVE, (3) THE USE OF PERT RESULTS IN CLEARER DEFINITION OF EACH ACTUAL TASK TO BE DONE, (4) THE USE OF PERT ENABLES THE PROJECT MANAGER TO IDENTIFY AT AN EARLY STAGE THE POTENTIAL TROUBLE SPOTS IN THE PROJECT PLAN, (5) THE USE OF PERT ASSISTS A PROJECT MANAGER TO KNOW WHERE TO RE-PLAN IN THE EVENT THAT THE ORIGINAL PLAN IS INAPPROPRIATE FOR SOME REASON, AND (6) THE USE OF NETWORK TECHNIQUES FACILITATES THE COMMUNICATION PROCESS SINCE PLANS ARE PORTRAYED IN A GRAPHIC MANNER. THIS PAPER WAS PRESENTED AT THE ANNUAL MEETING OF THE ASSOCIATION OF EDUCATIONAL DATA SYSTEMS (PHILADELPHIA, PENNSYLVANIA, MAY 3, 1966). (HW)

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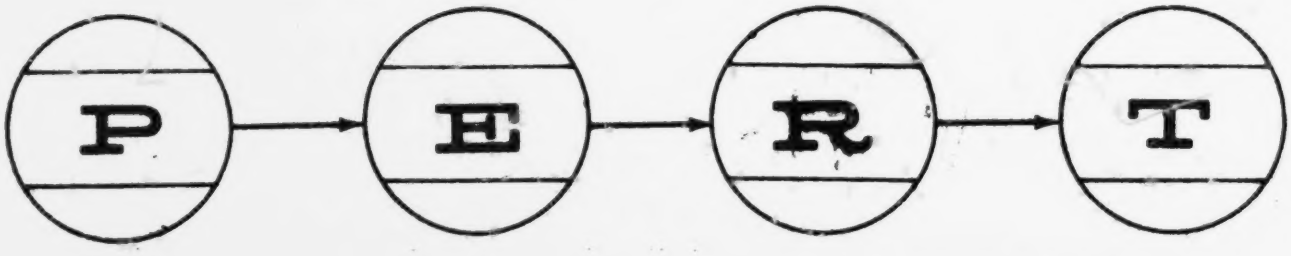

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PERT Applications in Educational Planning[1]

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The general topic to be discussed in this paper is the potential value that the Program Evaluation and Review Technique (PERT) has for educational planning. The title carries with it the presumption that PERT does have application for educational planning. My own preference in dealing with this topic is not to presume that it does but to ask instead the question, "Can or should PERT be applied to educational planning situations?" It seems to me that the answer to this question depends upon understanding both the nature and functions of PERT and the concept of educational planning. I should like therefore to discuss briefly the concepts of educational planning and PERT in order to provide a context for the subsequent discussion which aims to answer the question.

Types of Educational Planning

It might be helpful to start by describing the general concept of planning. Planning is something all of us do on a daily basis and hence its general characteristics are familiar to us. The initial step is to determine or identify a certain objective or goal that is to be reached. We then proceed to outline a sequence of activities or steps including possible alternatives, which must be accomplished to achieve the stated objective. Basically, planning is thus concerned with the structure and interrelationship existing between the units of effort required to reach

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an objective. Within the general concept of planning, one can talk not only about economic planning and military planning but also about educational planning. Within educational planning, two types or kinds of planning can be identified at the present time.

One type of educational planning relates to the long-range planning represented by such activities as the development of an educational program designed to meet the anticipated needs of an established and/or newly emerging nation for the next two or three decades or the establishment of master plans for the long-range development of an agency or institution. The master plan for higher education developed by the Ohio Board of Regents and the master plan developed for The Ohio State University by its planning office are illustrations of this latter usage. Further elaboration of the concept as used in this manner appears in the December 1965 issue of the Phi Delta Kappan (2) which is devoted to the concept of educational planning as it is used in the above situations.

A second type of educational planning relates to activities which are generally limited in scope and brief in duration as opposed to the more comprehensive and extended duration planning characterized above. Illustrations of this second type of planning are the construction of a new building, the development of a new curriculum, or the installation of a closed circuit educational television system. To distinguish this kind of activity from the more broader kind, the term project will be used to include the more limited types of activities. The succeeding remarks in this paper will be focused upon planning as related to educational projects as opposed to planning related to long range and comprehensive activities.

I would like to delimit further the use of the concept educational project by using it to describe those types of educational activities which

can be generally described as research and development projects. Being purposely simple at this point, a research and development project can be defined as a "once-through" or "non-repetitive" activity. That is, we are likely to do the project only once. Consequently, such projects are characterized by a great deal of uncertainty not only as to the specific goals to be reached in many cases but, more importantly, with how to plan to reach the goal. The problem is often made more difficult by the fact that the goal must be reached by some established date within a specified budget.

Normally, one person is designated to be responsible for such projects and is given authority for the proper organization and execution of the project. Such persons are typically as designated project directors. Even though called directors, such persons have to take executive actions and make decisions just as all managers do regardless of whether they are in education or in some other area. Hence, project directors might be more appropriately referred to as project managers.

The Nature of PERT

Regardless of his location, a project manager has need for certain kinds of information in order to make decisions and take appropriate actions. In general, information is needed about the status of the project in terms of time (or schedule), costs (or resources) and performance. There is a need to know whether or not the project is ahead or behind schedule, whether or not the budget will be over- or under-run, and whether or not work is being performed on a satisfactory basis, both quantitatively and qualitatively. The past several decades have seen the development of many techniques which could provide quickly and accurately the information described above to a manager so that project accomplishment could be reviewed

against the original plan. Decisions could then be made as necessary in order to bring the project to a successful completion. Such techniques are generically referred to as management information systems. Basically, PERT is considered to be one of these systems.

PERT is defined in a recent handbook published by the Special Projects Office of the Department of the Navy (1) as "...a set of principles, methods, and techniques for effective planning of objective-oriented work, thereby establishing a sound basis for effective scheduling, costing, controlling, and replanning in the management of programs or projects." Although PERT was developed by the Department of the Navy because of the need for an effective project control system, the potential use of PERT as an aid in the planning phase of projects was readily recognized. Thus, PERT is recognized today not only as an effective tool or technique for the manager to control a project once underway but also as an effective technique for the planning of the same project.

PERT utilizes the network concept as a means of representing the project plan. A network is a graphical representation of work sequence using arrows to represent work or tasks (called activities) to be done and circles to represent the initiation or completion of work (called events). The sequence of tasks and the interrelationships existing between the several tasks necessary to reach the objective can be readily grasped since the network is a graphical representation of the plan. For those persons interested in learning more about the use of the network technique in project planning, I suggest you become familiar with the book Planning by Network authored by H. S. Woodgate (3).

The one feature of PERT which distinguishes it from other techniques utilizing the network approach to planning is that it is expressly designed

to take into account the uncertainty associated with non-repetitive research and development projects. This is accomplished by securing multiple estimates (usually three) of the time needed to complete each piece of work or task in the project plan. These time estimates constitute part of the data base which makes up the information presented to the project manager so that he can note significant deviations of actual time from the estimated time and thus take appropriate corrective actions.

PERT in Educational Planning

Let us now return to the question posed earlier in this paper, "Should or can PERT be applied to educational planning?" The basic answer to this question lies in whether or not PERT has validity for the project manager in the educational research and development situation. That is, is there a need for the same information needed by a project manager in the military and/or industrial situation? Does a project manager in education have need to know whether or not a project is running ahead or behind schedule, whether or not actual costs are going to overrun or underrun estimated costs, or whether or not the work is being performed satisfactorily in terms of quantity and quality? Should it be determined that he does not have need for this kind of information, then PERT has limited, if any, applicability. Another management technique might well suffice for the educator's situation.

During the past two years, the author of this paper has been studying the applicability of PERT to education with specific reference to educational research and development activities. After examining the nature and purpose of educational research and development projects, the general characteristics of such projects appear to be sufficiently similar to

research and development projects in other areas (e.g., military and industry) that the project manager does indeed have a need to know about the time, cost, and performance status of his project in order to make the necessary decisions to complete the project successfully. If uncertainty, complexity, schedules, and non-repetitiveness characterize projects in general, these same characteristics are found in educational research and development activities. Most particularly they are found to exist in projects which are funded or supported by such programs as the Cooperative Research Program of the U. S. Office of Education. It is this author's contention that there is so much similarity that the benefits accruing to project managers who use PERT for planning in non-educational situations can accrue also to project managers in the educational situation. Thus, the answer to my original question is Yes. It should be pointed out that the ultimate validity will rest upon the gains in efficiency and economy secured when PERT is applied to such projects. Until sufficient objective evidence is accumulated to accept or reject PERT on this basis, the value of PERT for educational projects will have to rest largely upon situation similarity.

It should also be noted that there are many planning situations in education for which PERT is not applicable or suitable. Reference is made primarily to those kinds of activities wherein the work flow has been fairly well established because the task has been done often enough and a sufficient historical base established so that one could easily establish the plan to accomplish an objective once the "go-ahead" had been given.

Some Benefits from Using PERT in Planning

While it is difficult to separate planning from control (i.e., noting deviations from plan and taking corrective actions), I would like to highlight several benefits that I have observed to result when PERT principles are applied to the planning function associated with educational research and development projects.

First, the use of PERT in planning often results in a clearer statement of project objectives and goals. It is not at all unusual to find objectives so written that they include not only the goal to be reached but the procedures to be used in reaching it. In some cases, the means even become the end. For example, in a recent project proposal a major objective started with the words "to collect, analyze, and to study data..." An objective starting with these words is describing the process by which one hopes to reach the objective. In this particular case, the objective or goal was to be a report describing certain administrative conditions existing in a selected institution. The objective or goal was thus a status report. The collecting, summarizing and analyzing of data were the means to reach that goal. Since network techniques continually emphasize goals (often explicitly stated as products, hardware, reports, and similar items) to be reached, the technique is highly beneficial in having such outcomes identified before planning begins.

Second, the use of PERT requires that the person or persons involved in the project make explicit and not leave implicit the means by which they plan to reach the objective. In doing so, many pieces of work or tasks that would normally be omitted are clearly stated. By asking consistently what tasks are to be done, what inputs are necessary to do the

tasks, and what outputs were to be produced, the interdependency and sequence of tasks to be accomplished are more clearly outlined.

Third, the use of PERT results in a clearer definition of each actual task to be done. In one project with which the author worked, an activity or task was described as "review films." When attempting to establish time estimates for this activity, it was found necessary to ask exactly what work was involved in the task. The investigators indicated that film catalogs had to be examined, appropriate films selected, observers trained, films ordered, and films actually reviewed. As a consequence of this question, these several tasks were established as separate activities and then time estimates secured. As a consequence, the total time estimate for the larger task was perhaps more realistically established than it would have been for the more global activity description as originally established.

Fourth, the use of PERT enables the project manager to identify early potential trouble spots in the project plan. For example, one phase of the project concerned with studying the applicability of PERT to education involved preparing for and presenting a series of orientation or dissemination lectures throughout the United States. As the work moved along in the preparation phase, the project status reports indicated that if this work proceeded at its current rate the established deadline date for actually presenting the lectures would not be reached. In fact, a condition of being four weeks late was noted. Knowing about this possibility approximately a month to two months in advance of the initial lecture date, we were able to take corrective action. This was done by defining more carefully the materials to be presented and by securing additional personnel to prepare some of the materials. We were thus able to make the deadline date established. In effect, we replanned so as to meet the goal.

Fifth, the use of PERT assists a project manager to know where to re-plan in the event that the original plan is inappropriate for some reason. For example, in working with some colleagues on preparing a project proposal for submission to the Office of Education, a network was drawn and time estimates secured for each activity. The total estimated time for the project was 24 months. In response to questions directed to the Office of Education, the initiators were told that funds were available for only 18 months and not 24 months. With this information in mind, the investigators were able to look at the project plan as represented by the network and make necessary revisions on the critical path (longest network path in time) initially and then revise other network paths so as to reduce the total project time to the 18 month period. I am sure that if the investigators had not had a network available to them, the necessary replanning would not have been as efficiently carried out.

Sixth, the use of network techniques facilitates the communication process since plans are portrayed in a graphic manner. One does not have to read a verbose description of procedures in order to ascertain the investigators plan of attack. The overall plan is readily grasped along with the sequence and interrelationship of tasks. Our experience has shown that the drawing of the network before preparing the formal written procedures actually helps to provide a clearer statement of the latter.

The above benefits are some of the major ones which we have found to accrue when the general concept of network planning and the particulars of the PERT technique are applied to research and development projects. In general, I would say that perhaps the major overall benefit to be gained is that project planning is now made explicit. There is visible proof

that a plan does exist to reach the established goal. The plan is thus no longer carried around inside someone's head thereby making it difficult for others, including those involved in the work itself, to know exactly what the sequence of work is and how they fit into the total picture. I would maintain that even if the control features of the PERT technique were not employed by a project manager, the utilization of PERT concepts and principles in planning would alone be worth the time and effort expended to become acquainted with the technique.

The increasing amounts of money becoming available for education as represented by the Cooperative Research Program of 1954 through to the Elementary and Secondary Education Act of 1965 requires that planning be a more explicit function than ever before on the part of those having managerial responsibilities for federally supported projects. The establishment of large and complex programs of research development as represented by the research and development centers in education, the Regional Education Laboratories, the Vocational and Technical Education Centers, will require that the directors and administrative staff of such programs become highly skilled planners as well as doers of research. To this writer, PERT would be an indispensable aid to these persons as they carry out the planning function.

I would at this point like to assure my colleagues in the area of educational administration that my continued reference to research and development does not indicate a lack of concern for those educational activities not fitting the project category but which might likely fall under responsibility of a school administrator. No slight is intended. Many administrators have managerial roles and thus are highly concerned with the problems and procedures of decision-making. I have chosen to emphasize the

role of the project manager as opposed to administrator because it was within research and development types of activities that PERT developed and where it has had its largest implementation. Those persons charged with the planning and control of such projects are generally referred to as managers, not administrators. Regardless of whether or not they are called managers or administrators, the concern is with good planning. PERT can be a useful tool in the planning of a project, whether it be in research, development, or administration.

Conclusion

In conclusion, let me reinforce two points with regard to using PERT as an aid in the educational planning function. First, it must always be kept in mind that PERT is a tool which is useful in planning but does not plan in and of itself. It will reflect only the degree and maturity of planning that is present in the minds of the planners. Bad planning will always be bad planning. Knowledge of PERT concepts and principles can and does make for more efficient planning than might otherwise be the case. Second, the basic function of PERT is to provide project managers with information that it is necessary for him to have as he carries out his role of decision-maker. Without such information, the risk of making inappropriate decisions is increased and the accomplishment of the plan is placed in jeopardy.

Whenever we engage in planning, we do so because our intent is to control our progress in reaching the goal. PERT is a useful technique for accomplishing both of these functions. Its demonstrated value in the planning function alone, however, is a strong enough reason for educators to become familiar with the concepts and principles involved.

References

(1) PERT Handbook, Department of the Navy, Special Projects Office, Washington, D. C., October 25, 1965.

(2) Phi Delta Kappan, Vol. LXVII, No. 4, December, 1965.

(3) H. S. Woodgate, Planning by Network, Business Publications Limited, London, England, 1964.